CALIFORNIA DEPARTMENT OF HEALTH SERVICES
2151 Berkeley Way, Room 118, Berkeley, CA 94704

ENVIRONMENTAL MANAGEMENT BRANCH
Marine Biotoxin Monitoring and Control Program

BIOTOXIN QUARTERLY REPORT

April - June 2002

BIOTOXIN SUMMARY

The enclosed reports (No. 02-15 through 02-20) provide a summary of biotoxin activity and toxigenic phytoplankton distribution for the months of April through June 2002.

Early PSP Toxicity Continues, Record Domoic Acid Levels Documented

April – *Alexandrium* continued to increase in relative abundance, causing continued high concentrations of PSP toxicity in oysters from Tomales Bay through the first week of April.

An interesting pattern developed along the southern California coast involving a southward progression of *Pseudo-nitzschia* blooms (Figure 1) and resultant domoic acid (DA) toxicity in shellfish and other species (Figure 2). The relative abundance of this diatom increased dramatically along the San Luis Obispo (SLO) coast in April, resulting in elevated levels of DA in mussels. Observed concentrations reached 113 ppm inside Morro Bay on April 8. Samples of rock crab collected by the Department's Food and Drug Branch contained variable levels of DA in the viscera, with one of seven samples exceeding the alert level of 30 ppm for crab viscera (61 ppm).

As the SLO bloom declined throughout the month, another bloom began along the Santa Barbara coast that would result in record concentrations of DA in shellfish. As the relative abundance of *Pseudo-nitzschia* increased throughout April, DA concentrations increased in mussels from our monitoring stations. By the end of April the concentrations had exceeded 100 ppm both at nearshore and offshore stations; mussels from an offshore oil platform contained 230 ppm of domoic acid. A rock scallop sample collected concurrently from the same platform contained 5.8 ppm of DA in the viscera and < 1 ppm in the adductor muscle.

DA concentrations also increased dramatically in mussels from nearshore stations in Ventura County during the last two weeks of April. Samples collected by the Ventura County Environmental Health Department reached 55 ppm by April 22. Although *Pseudo-nitzschia* abundance was low offshore near Catalina Island, high concentrations of this diatom were observed just offshore of Los Angeles County (inside Santa Monica Bay, and at a nearshore site at Cabrillo Beach) and Orange County (Santa Catalina Channel). Similarly, mussel samples from nearshore sites in Los Angeles County did not contain detectable levels of DA in April while increasing concentrations were detected in mussels from an oil platform offshore of Orange County.

The National Oceanographic and Atmospheric Administration (NOAA) CoastWatch Program's "El Nino Watch" advisory reported increased upwelling in April compared to March. Sea surface temperatures were below normal southward from Santa Barbara to Los Angeles and offshore.

May - *Alexandrium* continued to increase slightly in distribution along the northern California coast but decreased along southern California counties. PSP toxicity was not detected in shellfish from any sampling location in May.

Pseudo-nitzschia numbers increased slightly in northern California along the Marin coast, with continued low levels of DA in shellfish inside Tomales Bay.

The southward progression of *Pseudo-nitzschia* along the southern California counties observed in March and April

How to Contact Us:

The Biotoxin Quarterly Report is prepared and distributed by the California Department of Health Services' Marine Biotoxin Monitoring and Control Program.

For information on our program please call (510) 540-3423, fax us at (510) 540-2716, or send an email to glangloi@dhs.ca.gov.

Call our toll-free number for recorded information on shellfish quarantines related to marine biotoxins: ***(800) 553-4133.***

continued through May. As the relative abundance of this diatom decreased along the San Luis Obispo coast, we continued to observe high densities along the coast of Santa Barbara and increasing numbers along the coast of Los Angeles. The Santa Barbara bloom continued to produce very high concentrations of DA in shellfish. A record level of 380 ppm was detected in mussels from an offshore oil platform at the beginning of the month. Domoic acid concentrations appeared to peak during the first week of May and steadily declined throughout the month. By May 15 mussel concentrations dropped to 3 ppm at Goleta Pier from an earlier level of 120 ppm on May 1.

Thanks to participants at the U.C. Santa Barbara Marine Science Institute (UCSB) we were able to track this event closely and gather additional toxicity data on other species that are less frequently sampled. Rock scallops taken from an offshore platform concurrently with the mussels that contained 380 ppm of DA had only low levels of this toxin in the viscera (4.4 ppm) and adductor muscle (5.4 ppm). A small tellinid clam (tentatively identified by UCSB as *Semele rupicola*) taken from amongst the mussel beds at this site contained 82 ppm of DA. In addition, we detected 10 ppm of DA in gooseneck barnacles (*Pollicipes polymerus*) and 28 ppm in the viscera of brown rock crab (*Cancer antennarius*). Rock scallops from another offshore platform also had a very low level of DA in the viscera (3.5 ppm) and adductor muscle (2.5 ppm) compared to mussels from the same site (200 ppm).

Pseudo-nitzschia numbers and DA concentrations continued to decline along the Ventura coast in May. There was a brief resurgence in toxicity, with mussels from Mussel Shoals increasing from <1 ppm on May 14 to 20 ppm on May 21, returning to a nondetectable level by May 29. Thanks to volunteer collector Bill Weinerth a sample of Pismo clams (*Tivela stultorum*) collected on May 27 was analyzed and found to contain a low level of DA in the viscera (3.7 ppm), with no detectable amount in the muscle tissue. Members of the Los Angeles County Health Department's Public Health Investigations Branch provided numerous samples from the entire L.A. coast in response to this event. As the relative abundance of *Pseudo-nitzschia* increased along the Los Angeles (LA) coast, DA levels also continued to increase. Although toxin levels in the upper coastal region of LA (Malibu) peaked at the beginning of the month (28 ppm), DA levels farther downcoast (Palos Verdes peninsula) continued to increase through May 19. DA concentrations reached 170 ppm in mussels from this area, decreasing to nondetectable levels by the end of the month.

In another fascinating development, program participants began reporting massive beachings of pelagic red crab (*Pleuroncodes planipes*) along the coast of San Diego, LA, and on a far offshore island. Samples of these "crab", actually a galatheid shrimp also commonly referred to as "tuna crab", were obtained by Paul Sims and Randy Dick in San Diego, Mike Mina of the Los Angeles County Public Health Investigations, and the U.S. Navy San Nicolas Island, Environmental Planning and Management Department. All samples contained high concentrations of domoic acid, with the red crab from offshore reaching 374 ppm. The high levels of toxin documented in this species suggests another pathway for transmitting this toxin to marine mammals and human consumers; apparently this species is fished and marketed commercially in other parts of the world.

The NOAA Coastwatch Program's "El Nino Watch" advisory reported an increase in the coastal area affected by colder than normal water. The region between Santa Barbara and San Diego was 1°C below normal.

June – *Alexandrium* numbers decreased along the northern California coast and remained low along the southern California counties as well, with the exception of Santa Monica, where a slight increase was observed. PSP toxicity was not detected at any site. There was little change in the low numbers of *Pseudo-nitzschia* along the northern California coast and the relative abundance of this diatom continued to decrease significantly along the southern California coast. Higher abundances of this toxin producer were detected offshore near the Channel Islands, particularly near Santa Cruz Island. Domoic acid was not detected in any mussel samples with the exception of a low level in a sample from Leo Carillo Beach in LA (2.7 ppm). However, pelagic red crab samples from the LA coast and from offshore continued to contain very high concentrations of domoic acid through the middle of the month when the last samples were collected. Concentrations in red crab were lower than observed in May, ranging from 98 ppm (offshore) to 160 ppm at Cabrillo Beach. Rock scallops from Redondo Beach did not contain DA, however a sample of lobster viscera taken from this area at the same time was found to contain 37 ppm of the toxin.

The NOAA Coastwatch Program's "El Nino Watch" advisory reported a significant increase in upwelling along the west coast, with temperatures at least 1°C below normal from San Luis Obispo to Los Angeles.

QUARANTINES

The annual quarantine on sport-harvested mussels began early this year. As a result of the continued increase in the distribution and concentration of domoic acid the annual quarantine began on April 19. This annual quarantine applies only to sport-harvested mussels along the entire California coastline, including all bays and estuaries.

In response to the series of domoic acid events along the coast from February to June, a number of warnings were issued to the public. In March consumers were advised to avoid eating all sport-harvested species of bivalve (two-shelled) shellfish, including clams, mussels, scallops and oysters, and anchovies, sardines and crab viscera, commonly known as crab butter, from Monterey Bay. Similar health advisories were issued on April 12 for Morro Bay (San Luis Obispo) and on May 10 for Santa Barbara, Ventura, and Los Angeles counties.

In addition, the California Department of Fish and Game and the California Department of Health Services issued a joint press release on May 1 to provide the public with an update on the series of domoic acid events. This press release addressed the reported impacts on marine mammals, contained background information on domoic acid, and provided instructions for reporting sick or deceased marine mammals.

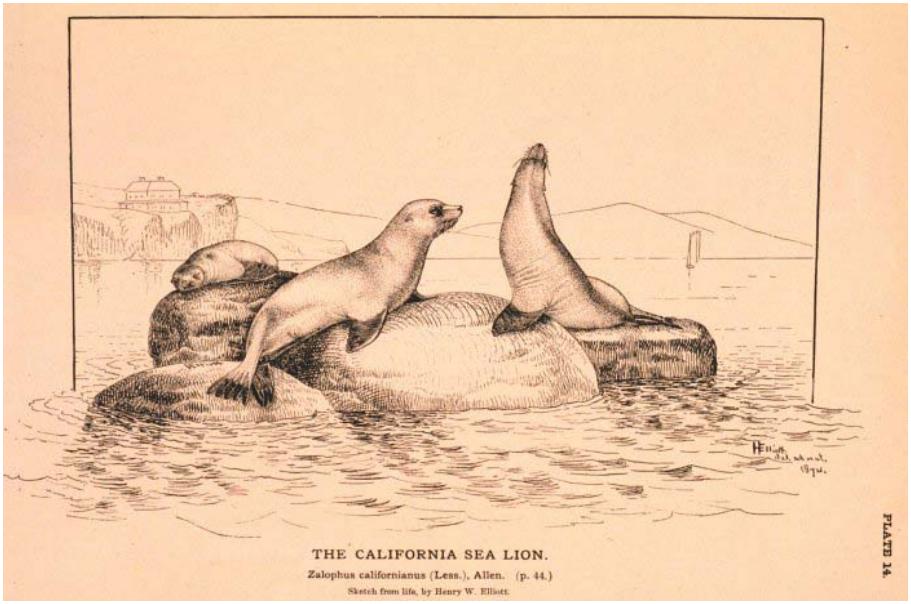


Image courtesy of the NOAA National Marine Fisheries Historic Image Collection. This etching was taken from the 1880's atlases of illustrations of "The Fisheries and Fisheries Industries of the United States".

MARINE MAMMAL IMPACTS

The record levels of DA detected throughout this series of *Pseudo-nitzschia* blooms had a dramatic impact on a number of marine mammal species, with sea lions and common dolphins suffering the greatest losses. Hundreds of seabirds such as brown pelicans were also affected. Newspaper articles documented the numerous strandings along southern California beaches and the efforts of marine mammal rescue centers to care for the stricken animals. The National Marine Fisheries Service's California Marine Mammal Stranding Network Database documented total strandings of over 1000 California seal lions and 93 common dolphins between January 1 and June 30, 2002. The majority of sea lion strandings occurred between Ventura and San Diego counties, with common dolphin strandings most numerous between Ventura and Los Angeles counties[1]. The Santa Barbara Natural History Museum[2] reported 31 common dolphin strandings from Ventura through San Luis Obispo counties between February and May. The majority of strandings occurred in the Ventura area.

[1] *Thanks to Joe Cordero for data from the U.S. Department of Commerce, NOAA/National Marine Fisheries Service, Southwest Region, California Marine Mammal Stranding Network Database.*

[2] *Data courtesy of Michelle Berman of the Santa Barbara Natural History Museum.*

BIOTOXIN REPORTS ONLINE

The 2001 annual biotoxin report and past quarterly reports can be viewed and downloaded from the DHS web site at the following address:

http://www.dhs.cahwnet.gov/ps/ddwem/environmental/Shellfish/Shellfish.htm

Figure 1. Temporal distribution and relative abundance of *Pseudo-nitzschia spp*. (north to south).

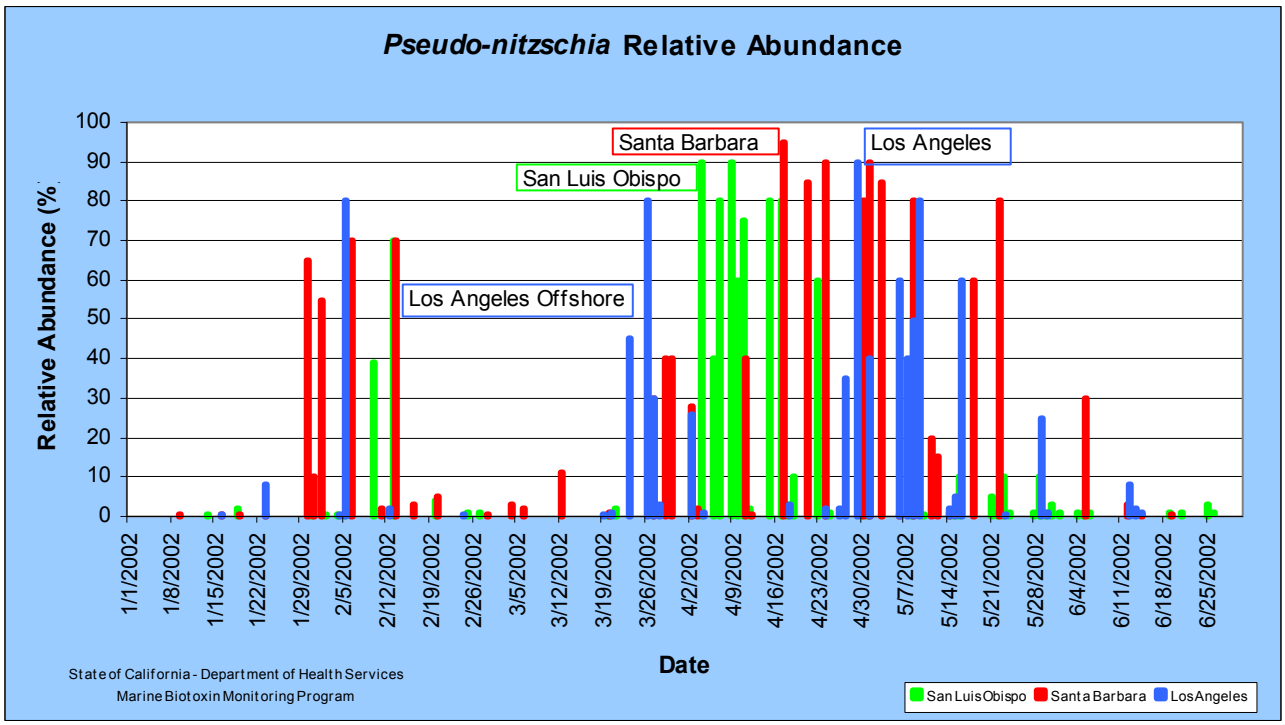


Figure 2. Domoic acid concentrations in shellfish, color-coded to geographical region (north to south).

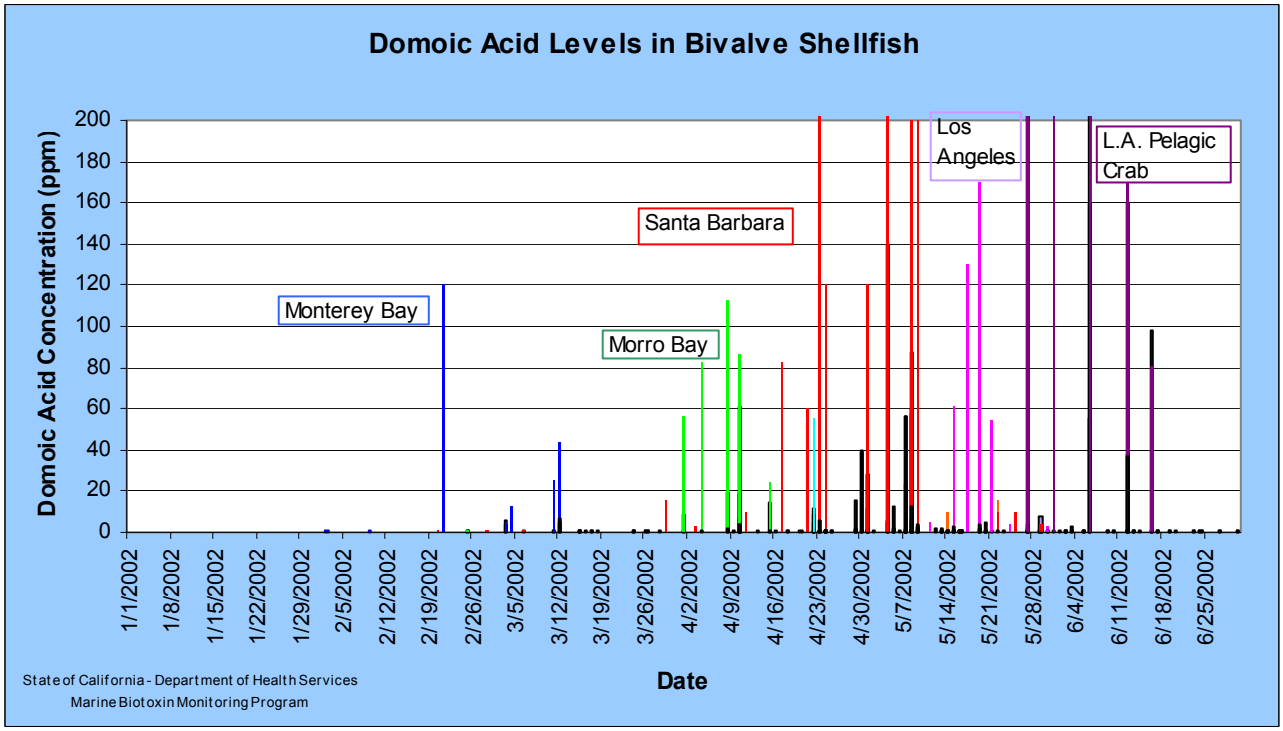


Table 1. California Marine Biotoxin Monitoring and Control Program participants submitting shellfish samples during April 2002.

COUNTY	AGENCY	SAMPLES
Del Norte	Del Norte County Health Department	2
Humboldt	Coast Seafood Company	5
	Humboldt County Environmental Health Department	2
Mendocino	Mendocino County Environmental Health Department	1
Sonoma	CDHS Marine Biotoxin Program	1
Marin	Cove Mussel Company	4
	CDHS Marine Biotoxin Program	4
	Hog Island Oyster Company	12
	Johnson Oyster Company	20
	Marin Oyster Company	8
	Point Reyes Oyster Company	2
	Tomales Bay Oyster Company	1
San Francisco	San Francisco County Health Department	1
San Mateo	San Mateo County Environmental Health Department	1
Santa Cruz	U.C. Santa Cruz	4
Monterey	None Submitted	
San Luis Obispo	Williams Shellfish Company	13
	CDHS Marine Biotoxin Program	1
	San Luis Obispo County Environmental Health Department	2
Santa Barbara	U.C. Santa Barbara Marine Science Institute	5
	Vandenberg AFB	1
	California Department of Parks and Recreation	1
Ventura	Ventura County Environmental Health Department	3
Los Angeles	Los Angeles County Health Department	4
Orange	Orange County Health Care Agency	1
	Ecomar, Inc.	4
San Diego	Carlsbad Aquafarms, Inc.	5
	CDHS Volunteer (Paul Sims)	2

Table 2. Agencies and organizations participating in marine phytoplankton sample collection in California during April 2002.

COUNTY	AGENCY	SAMPLES
Del Norte	None Submitted	
Humboldt	Coast Seafood Company	5
	Arcata High School	5
Mendocino	CDHS Volunteers (Jim Wesley, Amy Johnson)	2
Sonoma	Bodega Marine Lab	4
	CDHS Volunteer (Cathleen Cannon)	1
Marin	CDHS Volunteer (Brent Anderson, Cal Strobel, Richard Plant)	11
	CDHS Marine Biotoxin Program	2
	Johnson Oyster Company	16
Alameda	None Submitted	
San Francisco	CDHS Volunteer (Eugenia McNaughton)	2
San Mateo	San Mateo County Environmental Health Department	1
	CDHS Volunteer (Sandy Emerson)	2
Santa Cruz	None Submitted	
Monterey	U.C. Reserve System	1
San Luis Obispo	CDHS Volunteer (Judy and Whit Whitmire, Renee and Auburn Atkins, Connie Marangi, Bill Schwebel)	12
	Morro Bay National Estuary Program	2
	Tenera Environmental	4
	Port San Luis Marine Institute	2
	CDHS Marine Biotoxin Program	12
Santa Barbara	U.C. Santa Barbara Marine Sciences	5
	California Department of Parks and Recreation	2
	Santa Barbara City College	2
	Vandenberg AFB	4
Ventura	Catalina Tall Ships Expeditions	1
Los Angeles	Los Angeles County Sanitation District	4
	Los Angeles County Health Department	4
	Catalina Island Marine Institute	3
	Catalina Tall Ships Expeditions	4
Orange	Orange County Sanitation District	5
San Diego	CDHS Volunteers (Randy and Bill Dick, Jeff Kermode, Paul Sims, Rachel Woodfield)	5
	San Diego County Environmental Health Department	5

Table 3. California Marine Biotoxin Monitoring and Control Program participants submitting shellfish samples during May 2002.

COUNTY	AGENCY	SAMPLES
Del Norte	Del Norte County Health Department	2
Humboldt	Coast Seafood Company	4
	Humboldt County Environmental Health Department	2
Mendocino	Mendocino County Environmental Health Department	1
Sonoma	None Submitted	
Marin	Cove Mussel Company	2
	Hog Island Oyster Company	4
	Johnson Oyster Company	15
	Marin Oyster Company	4
	Point Reyes Oyster Company	2
	CDHS Marine Biotoxin Program	2
San Francisco	San Francisco County Health Department	2
San Mateo	San Mateo County Environmental Health Department	2
Santa Cruz	U.C. Santa Cruz	5
	Santa Cruz County Environmental Health Department	1
Monterey		
San Luis Obispo	Williams Shellfish Company	10
	San Luis Obispo County Environmental Health Department	2
Santa Barbara	U.C. Santa Barbara Marine Science Institute	8
	CDHS Volunteer	1
Ventura	Ventura County Environmental Health Department	4
Los Angeles	Los Angeles County Health Department	16
Orange	Ecomar, Inc.	9
	Orange County Health Care Agency	1
San Diego	Carlsbad Aquafarms, Inc.	3
	CDHS Volunteer (Paul Sims)	2

Table 4. Agencies and organizations participating in marine phytoplankton sample collection in California during May 2002.

COUNTY	AGENCY	SAMPLES
Del Norte	Del Norte County Health Department	2
Humboldt	Coast Seafood Company	4
Mendocino	CDHS Volunteer (Amy Johnson)	1
Sonoma	Bodega Marine Laboratory	3
	Cordell Banks Marine Sanctuary	1
Marin	CDHS Volunteer (Brent Anderson, Cal Strobel)	5
	CDHS Marine Biotoxin Program	2
	Johnson Oyster Company	16
	Cordell Banks Marine Sanctuary	1
Alameda	None Submitted	
San Francisco	CDHS Volunteer (Eugenia McNaughton)	4
	Gulf of the Farallones National Marine Sanctuary	1
San Mateo	San Mateo County Environmental Health Department	1
	CDHS Volunteer (Sandy Emerson)	1
Santa Cruz	Aptos High School	1
	Santa Cruz County Environmental Health Department	4
Monterey	U.C. Reserve System	1
San Luis Obispo	CDHS Volunteer (Whit and Judy Whitmire, Renee and Auburn Atkins, Bill Schwebel)	8
	Tenera Environmental	4
	Morro Bay National Estuary Program	4
	Port San Luis Marine Institute	1
Santa Barbara	U.C. Santa Barbara Marine Sciences	4
	California Department of Parks and Recreation	3
	Santa Barbara City College	2
	Vandenberg AFB	1
Ventura	California Department of Parks and Recreation	4
Los Angeles	Los Angeles County Sanitation District	6
	Los Angeles County Health Department	18
	Catalina Island Marine Institute	3
	Catalina Tall Ships Expeditions	5
Orange	Orange County Sanitation District	4
	Ocean Institute	1
San Diego	CDHS Volunteer (Randy and Bill Dick)	2
	San Diego County Environmental Health Department	2

Table 5. California Marine Biotoxin Monitoring and Control Program participants submitting shellfish samples during June 2002.

COUNTY	AGENCY	SAMPLES
Del Norte	Del Norte County Health Department	2
Humboldt	Coast Seafood Company	4
	Humboldt County Environmental Health Department	1
Mendocino	Mendocino County Environmental Health Department	1
Sonoma	None Submitted	
Marin	Cove Mussel Company	4
	Hog Island Oyster Company	4
	Johnson Oyster Company	16
	Marin Oyster Company	5
San Francisco	San Francisco County Health Department	2
San Mateo	San Mateo County Environmental Health Department	2
Santa Cruz	Santa Cruz County Environmental Health Department	2
	U.C. Santa Cruz	5
Monterey	None Submitted	
San Luis Obispo	Williams Shellfish Company	10
	San Luis Obispo County Environmental Health Department	2
Santa Barbara	U.C. Santa Barbara Marine Science Institute	4
Ventura	CDHS Volunteer	1
Los Angeles	Los Angeles County Health Department	5
Orange	Ecomar, Inc.	2
San Diego	Carlsbad Aquafarms, Inc.	4
	CDHS Volunteer (Paul Sims)	1

Table 6. Agencies and organizations participating in marine phytoplankton sample collection in California during June 2002.

COUNTY	AGENCY	SAMPLES
Del Norte	Del Norte County Environmental Health Department	3
Humboldt	Coast Seafood Company	4
Mendocino	None Submitted	
Sonoma	Bodega Marine Lab	3
	Gulf of the Farallones Marine Sanctuary	4
Marin	CDHS Volunteer (Brent Anderson, Richard Plant)	6
	Johnson Oyster Company	16
	Gulf of the Farallones Marine Sanctuary	1
Alameda	None Submitted	
San Francisco	CDHS Volunteer (Eugenia McNaughton)	3
	Cordell Banks Marine Sanctuary	2
San Mateo	CDHS Volunteer (Sandy Emerson)	1
Santa Cruz	Santa Cruz County Environmental Health Department	3
Monterey	U.C. Reserve System	1
San Luis Obispo	CDHS Volunteer (Renee and Auburn Atkins, Bill Schwebel)	5
	Tenera Environmental	4
	Morro Bay National Estuary Program	2
	Port San Luis Marine Institute	1
Santa Barbara	U.C. Santa Barbara Marine Sciences	3
	Santa Barbara City College	1
Ventura	California Department of Parks and Recreation	1
	Catalina Tall Ships Expeditions	4
Los Angeles	Los Angeles County Sanitation District	3
	Los Angeles County Health Department	3
	City of Los Angeles Environmental Management	2
Orange	Orange County Sanitation District	6
San Diego	San Diego County Environmental Health Department	4
	CDHS Volunteer (Paul Sims)	1

CALIFORNIA DEPARTMENT OF HEALTH SERVICES
2151 Berkeley Way, Berkeley CA 94704-1011

ENVIRONMENTAL MANAGEMENT BRANCH
Marine Biotoxin Monitoring and Control Program

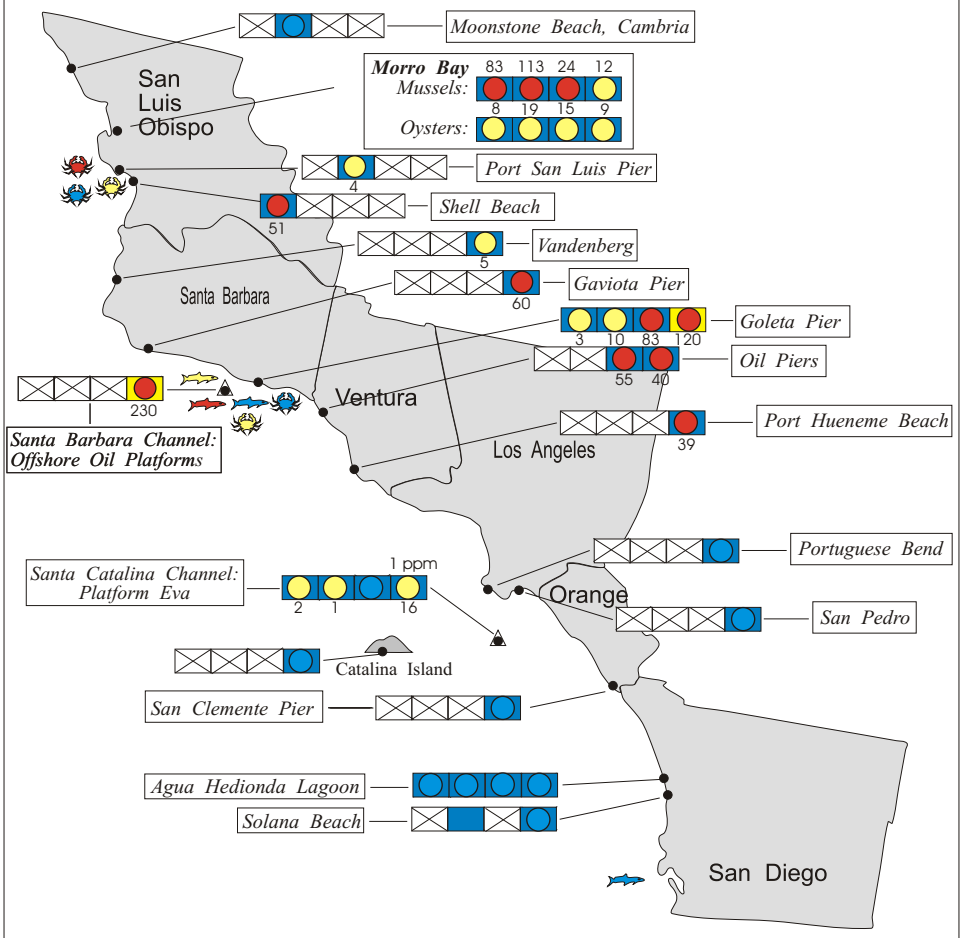
SHELLFISH BIOTOXIN MONTHLY REPORT

April 2002

Technical Report No. 02-15

Distribution of Shellfish Biotoxins

Southern California



KEY FOR SHELLFISH BIOTOXIN DATA

Week:	1	2	3	4
PSP Range: (ug/100 g)	no sample	not detected	< 80[1]	≥ 80
DA Range: (ppm)	no sample	not detected	< 20[2]	≥ 20

[1] PSP Alert Level [2] DA Alert Level
● = Single Site ◉ = Multiple Sites ▲ = Offshore Site

Source: DHS Marine Biotoxin Monitoring and Control Program, April 2002.

INTRODUCTION:

Please note the following conventions: (i) All data are for mussel samples, unless otherwise noted; (ii) All samples are analyzed for PSP toxins; domoic acid (DA) analyses are performed as needed (i.e., on the basis of detected blooms of the diatoms that produce DA). Please refer to the figure key for an explanation of the symbols used for the time of month of sample collection and the toxicity range.

Southern California Summary:

Paralytic Shellfish Poisoning (PSP): Low levels of PSP toxins (40 ug) were detected in mussels from two Santa Barbara County sites during the last week of April.

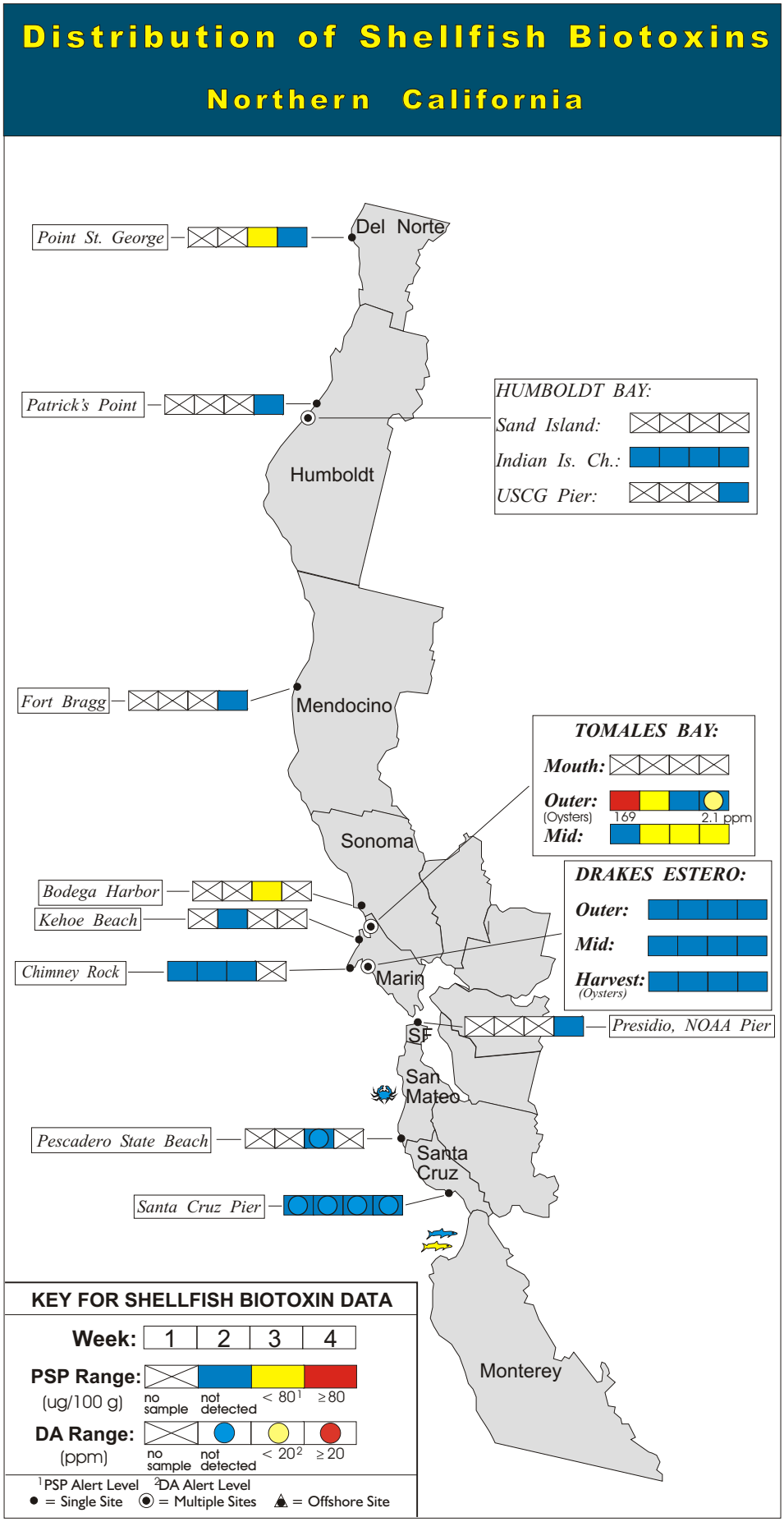
Domoic Acid (DA):

The first detectable levels of DA in Morro Bay (San Luis Obispo County) occurred on April 1 (56 ppm) and reached a peak concentration of 113 ppm by April 8. The levels of toxin decreased through the month and were nondetectable by May 1.

As DA concentrations in mussels from San Luis Obispo declined, concentrations of this toxin were increasing in shellfish from sites in Santa Barbara County. DA concentrations in mussels from Goleta Pier had briefly increased to 16 ppm at the end of March but declined to lower levels by April 3 (3.2 ppm). DA levels again increased throughout April at this site, exceeding the alert level by April 17 and reaching 120 ppm by April 24. Mussels from an offshore oil platform contained 230 ppm DA, the highest concentration of this toxin ever recorded in California shellfish.

For Information on our Volunteer Field Sampling Program Please Call:

(510) 540-3423



Northern California Summary:

Paralytic Shellfish Poisoning (PSP):

The elevated levels of PSP toxins detected in shellfish from Tomales Bay (Marin County) during March persisted into the first week of April. Oysters from the outer Bay contained 169 ug of toxins on April 2. These high levels steadily declined throughout the month, allowing termination of the harvest closure that had been imposed in March.

Low levels of PSP toxins were also detected in mussels from Bodega Harbor (Sonoma County) and Point St. George (Del Norte County) during the third week of April.

Domoic Acid (DA):

DA was only detected at one northern California site during April. Oysters collected from outer Tomales Bay during the last week in April contained 2 ppm DA.

The Marine Biotoxin Monitoring and Control Program is a state-wide effort involving a consortium of volunteer participants. The shellfish sampling and analysis element of this program is intended to provide an early warning of shellfish toxicity by routinely assessing coastal resources for the presence of paralytic shellfish poisoning (PSP) toxins.

For More Information Please Call:
(510) 540 - 3423

For Recorded Biotoxin Information Call:
(800) 553 - 4133

CALIFORNIA DEPARTMENT OF HEALTH SERVICES
2151 Berkeley Way, Berkeley CA 94704-1011

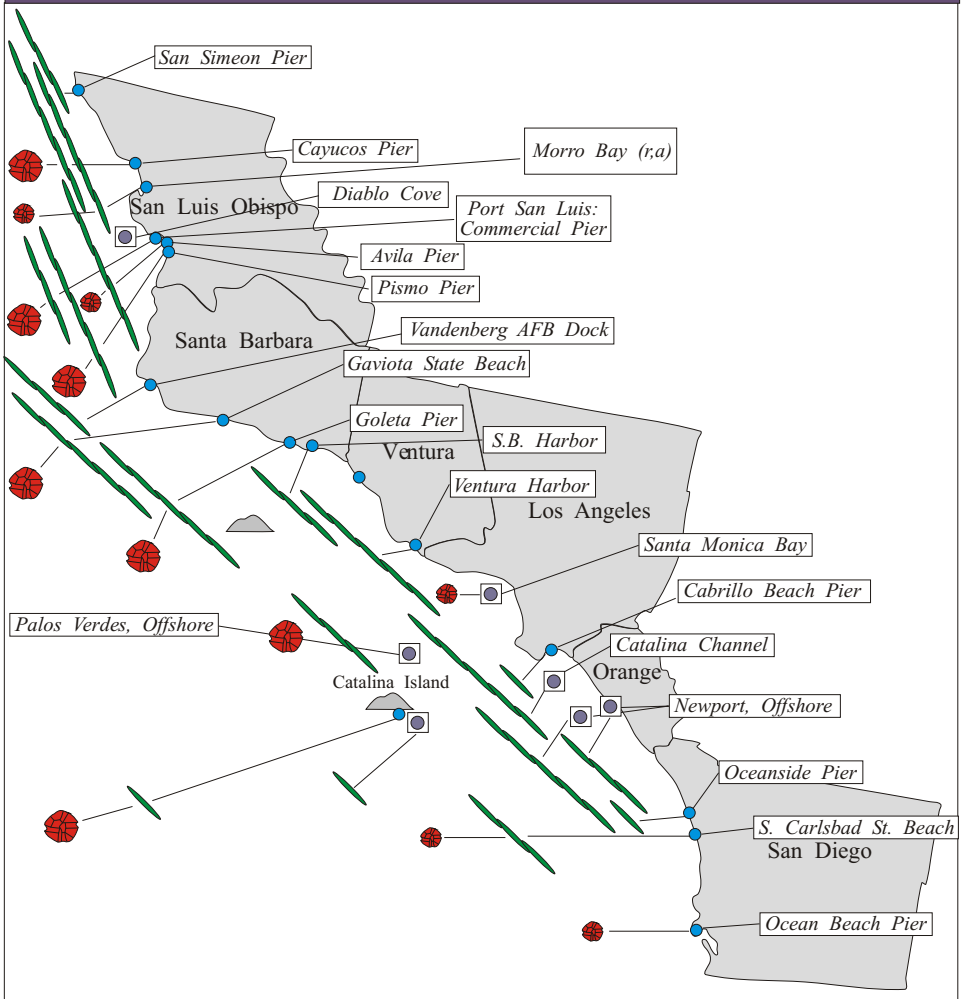
ENVIRONMENTAL MANAGEMENT BRANCH
Phytoplankton Monitoring Program

Phytoplankton Monthly Report

April 2002

Technical Report No. 02-16

Distribution of Toxin-Producing Phytoplankton
Southern California



Relative Abundance of Known Toxin Producers

Alexandrium Species

- Rare (less than 1%)
- Present (between 1% and 10%)
- Common (between 10% and 50%)
- Abundant (greater than 50%)

Pseudo-nitzschia Species

- Present (less than 10%)
- Common (between 10% and 50%)
- Abundant (greater than 50%)

MONTHLY SAMPLING STATIONS:

- Single Sampling Station
- Multiple Sampling Stations
- Offshore Sampling Station

For areas with multiple sampling stations, species abundance at each station is represented as follows:
(a,p) = Abundance for Alexandrium and Pseudo-nitzschia.
e.g., (c,p) = common, present; (a,-) = abundant, not observed

Southern California Summary:

Alexandrium catenella (Dinoflagellate that produces paralytic shellfish poisoning (PSP) toxins). The distribution and relative abundance of *Alexandrium* increased significantly along the entire southern California coast during April.

Pseudo-nitzschia species (includes all known potential domoic acid producing diatoms). *Pseudo-nitzschia* numbers increased dramatically along the entire southern California coast in April.

There appeared to be a southward progression to this toxic bloom over time for the nearshore stations. The greatest relative abundances of this diatom along the San Luis Obispo coast (90%) occurred within the first week of April, declining to low levels by the end of the month. In contrast, the numbers of *Pseudo-nitzschia* along the Santa Barbara coast were low at the beginning of the month but steadily increased to high abundances by the end of April. Although this diatom was present in low numbers in the nearshore Los Angeles area as well as farther offshore at Catalina Island, it was observed in high numbers in the middle of Catalina Channel (L.A. and Orange counties) at the end of April.

The Phytoplankton Monitoring Program, managed by the California Department of Health Services, is a state-wide program designed to detect toxin producing species of phytoplankton in ocean water before they impact California's valuable shellfish resources or become a threat to consumer safety.

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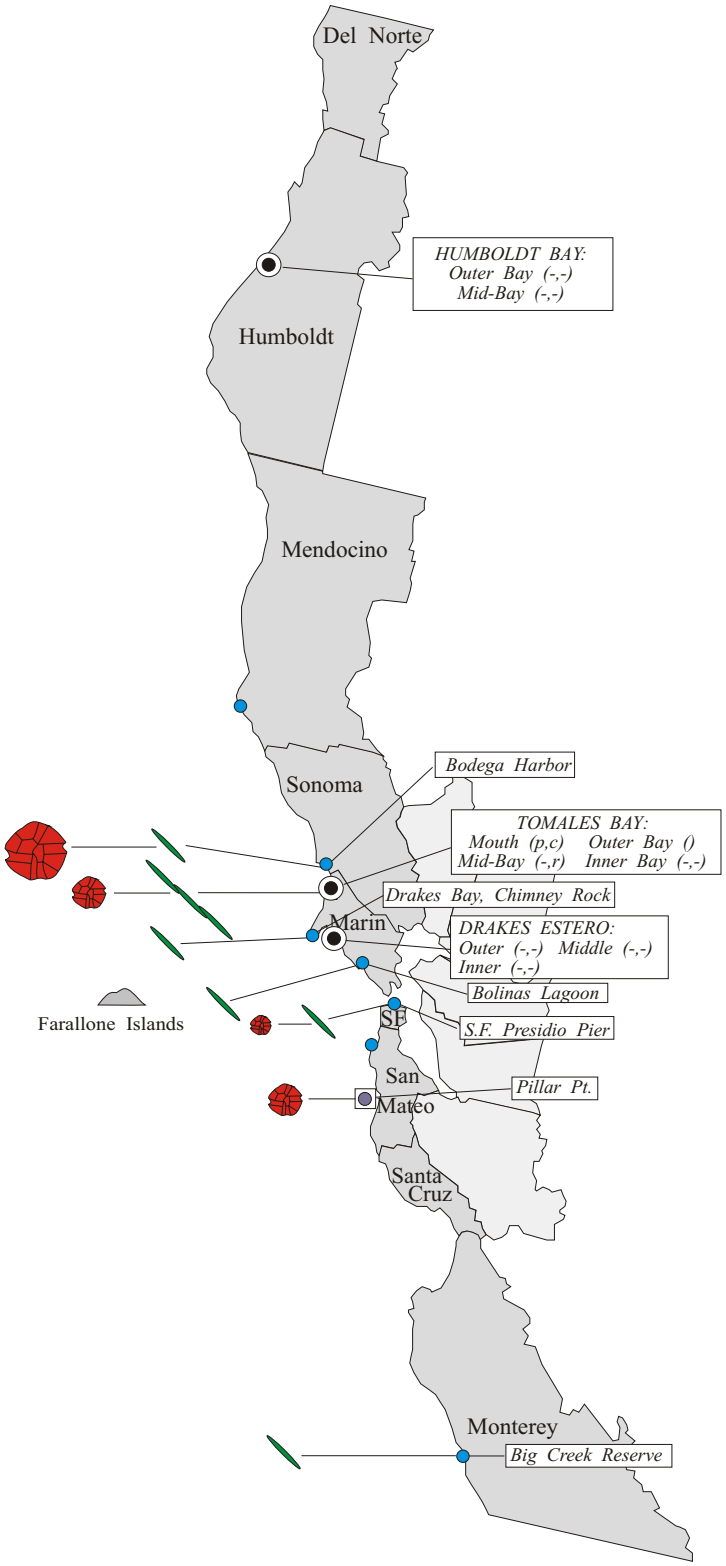
Distribution of Toxin-Producing Phytoplankton Northern California



Northern California Summary:

Alexandrium catenella (Dinoflagellate that produces paralytic shellfish poisoning (PSP) toxins). There was a noticeable increase in the relative abundance of *Alexandrium* in April, particularly in the northern California coastal area between San Mateo and Sonoma counties. Although the relative abundance of this dinoflagellate was greatest in Bodega Harbor, the cell mass was low as reflected in the low concentration of PSP toxins in mussels from this area (see technical Report #02-15).

Pseudo-nitzschia species (includes all known potential domoic acid producing diatoms). *Pseudo-nitzschia* decreased in distribution and relative abundance along the northern California coast between Monterey and Marin counties. Observations of this overall decline were consistent with the significant decrease in domoic acid concentrations in mussels from the Monterey Bay region (see technical Report No. 02-11 for shellfish toxin data).

The highest relative abundance of *Pseudo-nitzschia* in northern California was observed just inside Tomales Bay during the last week of April. These observations led to the analysis of shellfish samples from farther inside the Bay, which were found to contain low levels of domoic acid.

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ENVIRONMENTAL MANAGEMENT BRANCH
Marine Biotoxin Monitoring and Control Program

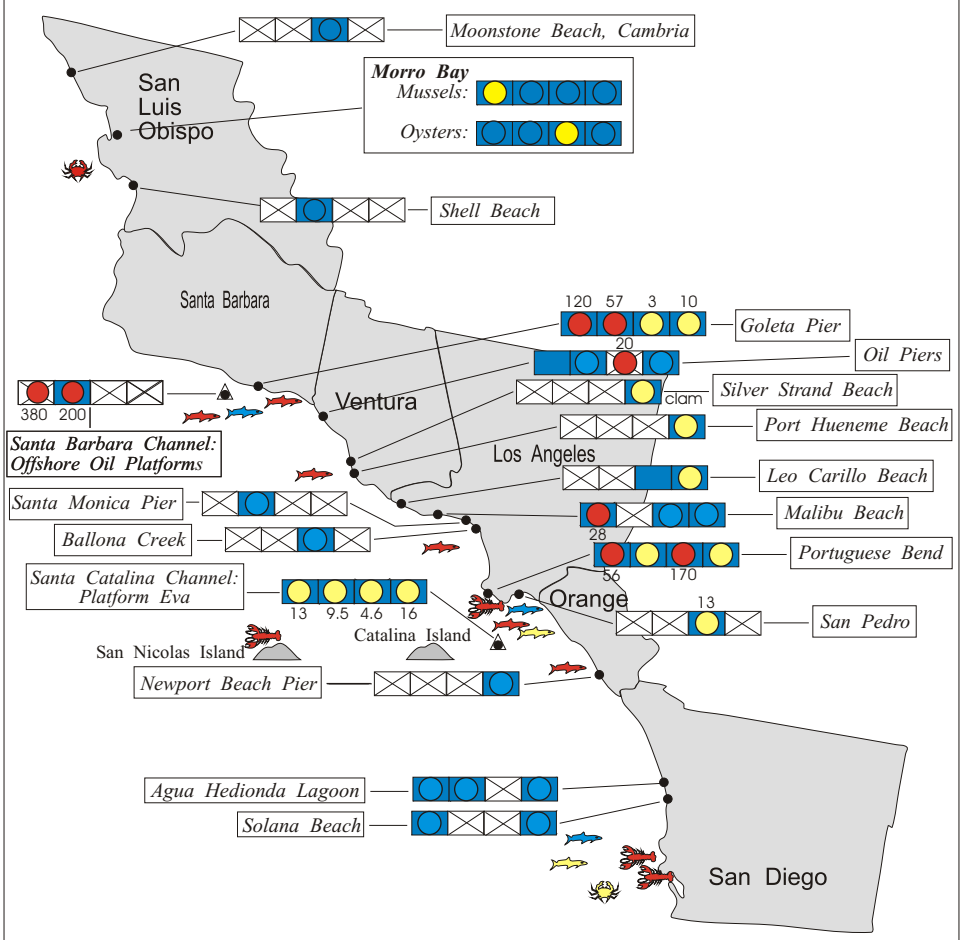
SHELLFISH BIOTOXIN MONTHLY REPORT

May 2002

Technical Report No. 02-17

Distribution of Shellfish Biotoxins

Southern California



KEY FOR SHELLFISH BIOTOXIN DATA

Week:	1	2	3	4
PSP Range: (ug/100 g)	no sample	not detected	< 80[1]	≥ 80
DA Range: (ppm)	no sample	not detected	< 20[2]	≥ 20

[1]PSP Alert Level [2]DA Alert Level
● = Single Site ◉ = Multiple Sites ▲ = Offshore Site

Source: DHS Marine Biotoxin Monitoring and Control Program, May 2002.

INTRODUCTION:

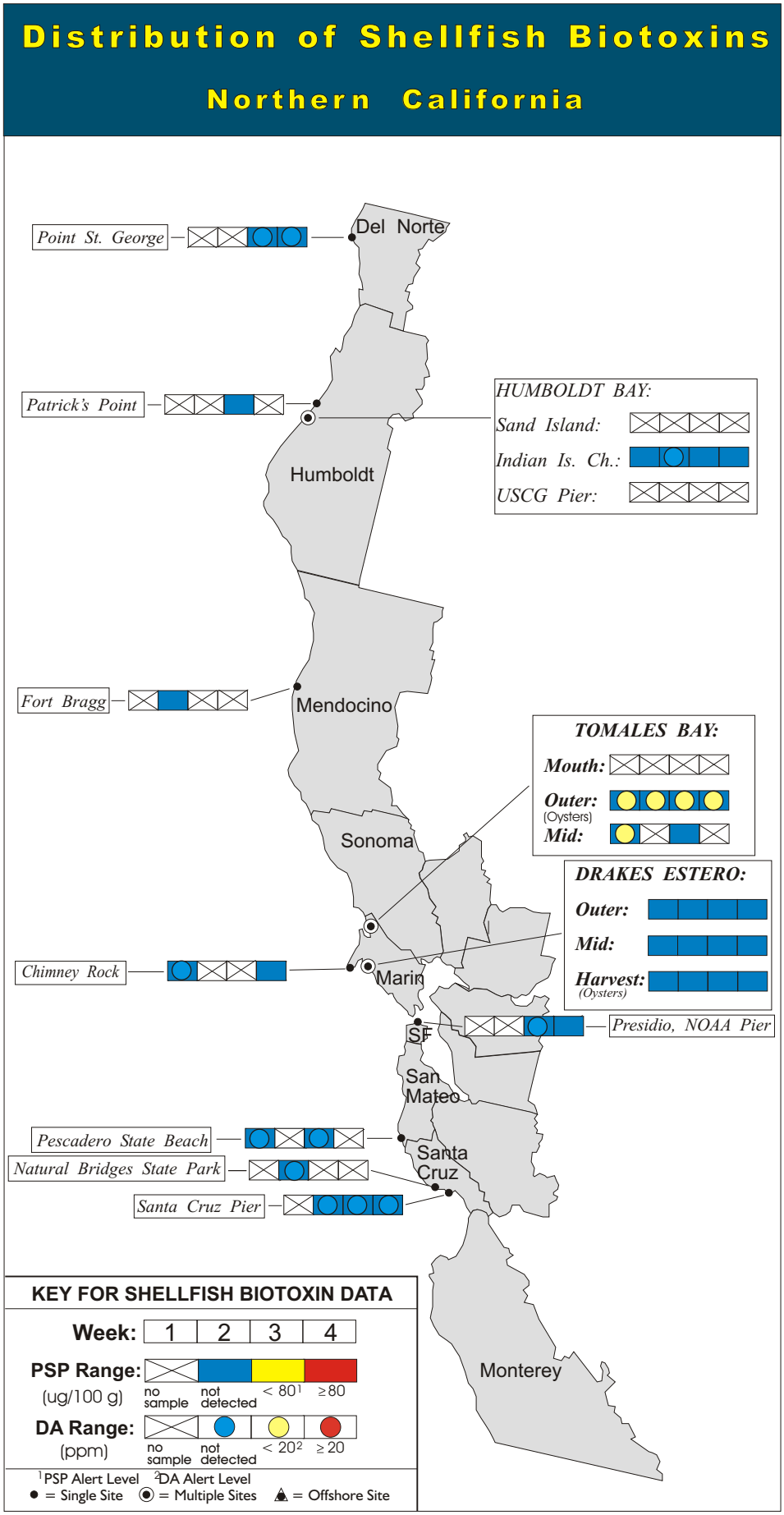
Please note the following conventions: (i) All data are for mussel samples, unless otherwise noted; (ii) All samples are analyzed for PSP toxins; domoic acid (DA) analyses are performed as needed (i.e., on the basis of detected blooms of the diatoms that produce DA). Please refer to the figure key for an explanation of the symbols used for the time of month of sample collection and the toxicity range.

Southern California Summary:

Paralytic Shellfish Poisoning (PSP): PSP toxins were not detected during May.

Domoic Acid (DA):

Concentrations of DA in mussels from Santa Barbara County sites continued to increase through the beginning of May. Peak domoic acid concentrations were detected on May 4 (380 ppm) in mussels collected from an offshore oil platform by researchers from the University of California Santa Barbara. This is the highest concentration of DA ever recorded in California shellfish. As the concentration of DA steadily declined at sites in Santa Barbara, levels of this toxin began increasing at sites along the Los Angeles coast, reaching 170 ppm on May 19. DA concentrations ranged from high to nondetectable in samples of sardine and anchovy collected by the DHS Food and Drug Branch. Pelagic red crab sampled by participants in San Diego, San Nicolas Island, and Los Angeles contained high levels of DA, reaching 374 ppm in an offshore sample (May 27). This is the first known documentation of elevated DA levels in this species and has potential significance both for human health risk and as a vector of DA for other marine species (e.g., mammals, birds). See the quarterly newsletter for more information on these and other findings.



Northern California Summary:

Paralytic Shellfish Poisoning (PSP):

PSP toxins were not detected in shellfish from northern California sites during May.

Domoic Acid (DA):

DA was only detected inside Tomales Bay during May. The low levels of DA in oysters from outer Tomales Bay detected in April continued through May. DA concentrations in this region did not exceed 2.4 ppm. DA was also detected in oysters farther inside the Bay near Cypress Point (1.2 ppm).

The Marine Biotoxin Monitoring and Control Program is a state-wide effort involving a consortium of volunteer participants. The shellfish sampling and analysis element of this program is intended to provide an early warning of shellfish toxicity by routinely assessing coastal resources for the presence of paralytic shellfish poisoning (PSP) toxins.

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2151 Berkeley Way, Berkeley CA 94704-1011

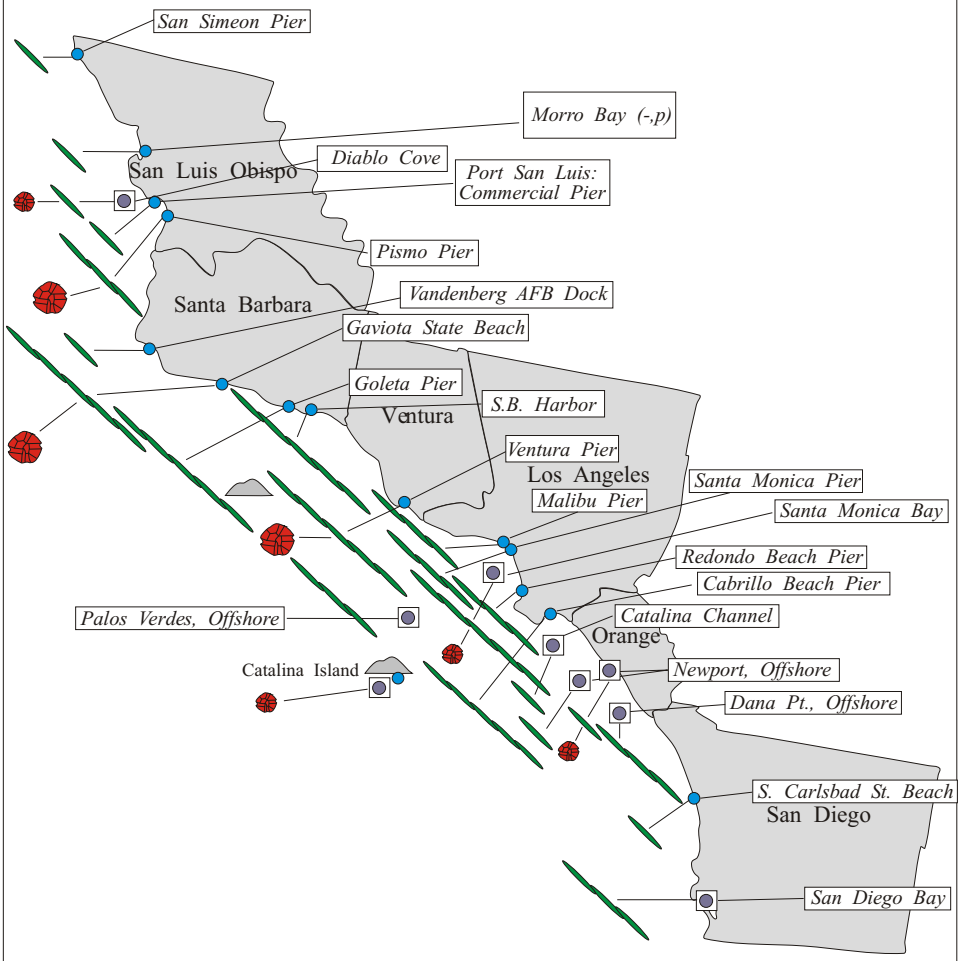
ENVIRONMENTAL MANAGEMENT BRANCH
Phytoplankton Monitoring Program

Phytoplankton Monthly Report

May 2002

Technical Report No. 02-18

Distribution of Toxin-Producing Phytoplankton
Southern California



Relative Abundance of Known Toxin Producers

Alexandrium Species

- Rare (less than 1%)
- Present (between 1% and 10%)
- Common (between 10% and 50%)
- Abundant (greater than 50%)

Pseudo-nitzschia Species

- Present (less than 10%)
- Common (between 10% and 50%)
- Abundant (greater than 50%)

MONTHLY SAMPLING STATIONS:

- Single Sampling Station
- Multiple Sampling Stations
- Offshore Sampling Station

For areas with multiple sampling stations, species abundance at each station is represented as follows:
(a,p) = Abundance for Alexandrium and Pseudo-nitzschia.
e.g., (c,p) = common, present; (a,-) = abundant, not observed

Southern California Summary:

Alexandrium catenella (Dinoflagellate that produces paralytic shellfish poisoning (PSP) toxins). The distribution and relative abundance of *Alexandrium* decreased slightly along the southern California coast in May.

Pseudo-nitzschia species (includes all known potential domoic acid producing diatoms). *Pseudo-nitzschia* numbers remained high along the southern California coast in May.

The southward progression of this toxic bloom continued into May, with a significant decline in relative abundances along the San Luis Obispo coast and a continued increase in numbers south of Point Conception. The high abundances of *Pseudo-nitzschia* observed in April along the Santa Barbara coast continued throughout most of the month. Elevated numbers of this diatom continued to be observed just offshore of Los Angeles and Orange counties during the first week of May, gradually declining through the end of the month at most sites. Farther offshore at Catalina Island *Pseudo-nitzschia* was no longer observed, with dinoflagellates appearing as a principle component of the phytoplankton as is more typical for the season.

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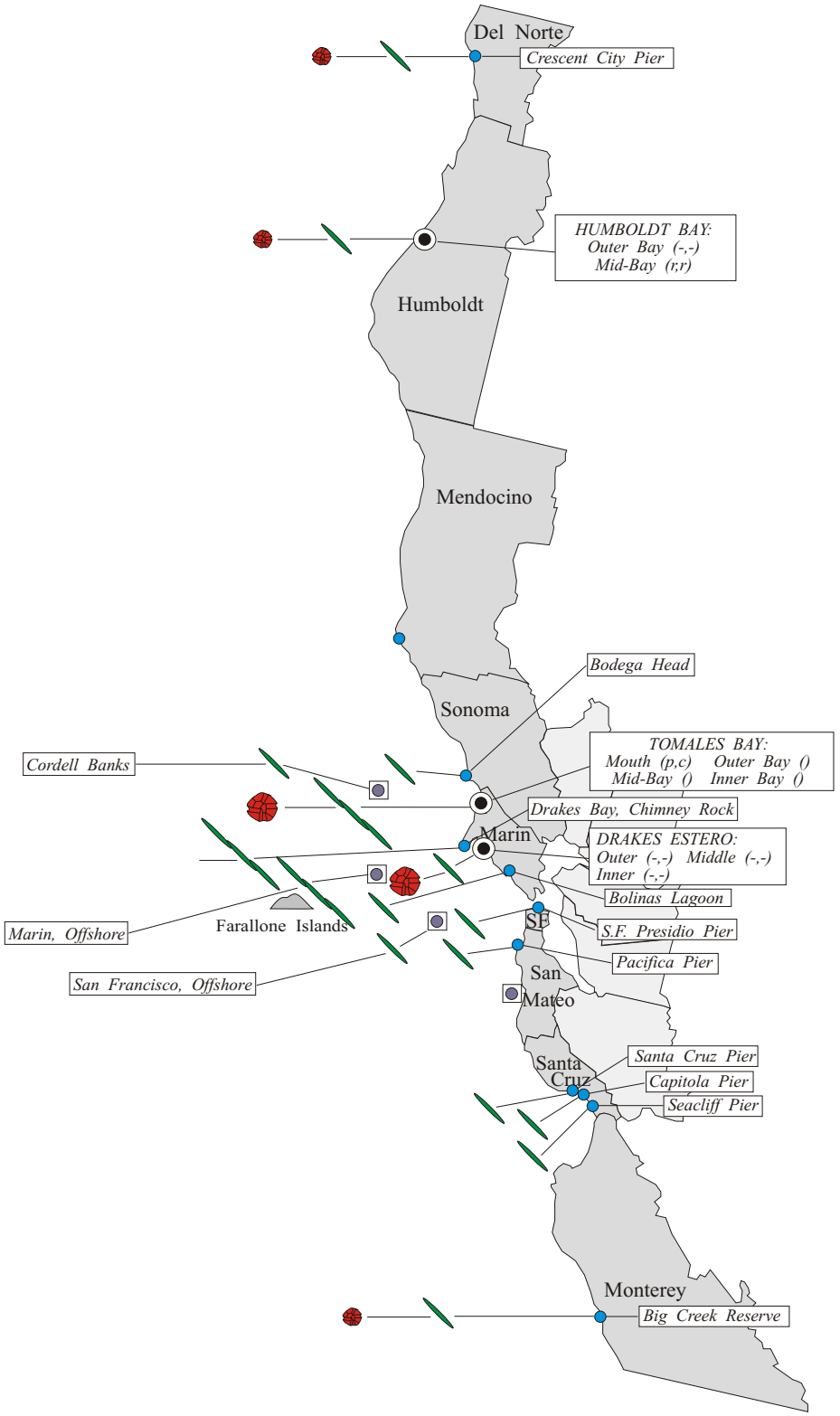
Distribution of Toxin-Producing Phytoplankton Northern California



Northern California Summary:

Alexandrium catenella (Dinoflagellate that produces paralytic shellfish poisoning (PSP) toxins). There was an increase in the distribution of *Alexandrium* in May, however relative abundances were lower than observed in April.

Pseudo-nitzschia species (includes all known potential domoic acid producing diatoms). *Pseudo-nitzschia* increased in distribution along the northern California coast, although relative abundances were low in most areas. As observed in April, the highest relative abundance of *Pseudo-nitzschia* was observed just inside Tomales Bay. Shellfish samples from farther inside the Bay continued to contain low levels of domoic acid. *Pseudo-nitzschia* was also common at other Marin sites, including an offshore location sampled by the Gulf of the Farallones Marine Sanctuary.

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ENVIRONMENTAL MANAGEMENT BRANCH
Marine Biotoxin Monitoring and Control Program

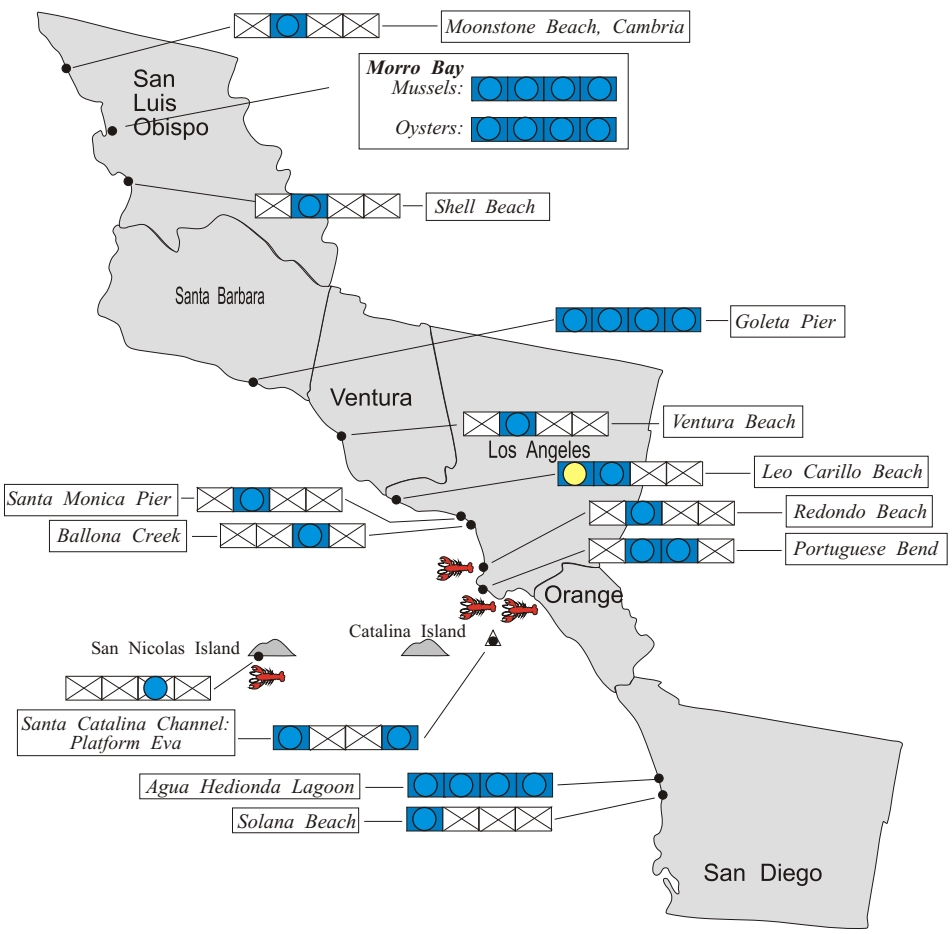
SHELLFISH BIOTOXIN MONTHLY REPORT

June 2002

Technical Report No. 02-19

Distribution of Shellfish Biotoxins

Southern California



KEY FOR SHELLFISH BIOTOXIN DATA

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[1]PSP Alert Level [2]DA Alert Level
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Source: DHS Marine Biotoxin Monitoring and Control Program, June 2002.

INTRODUCTION:

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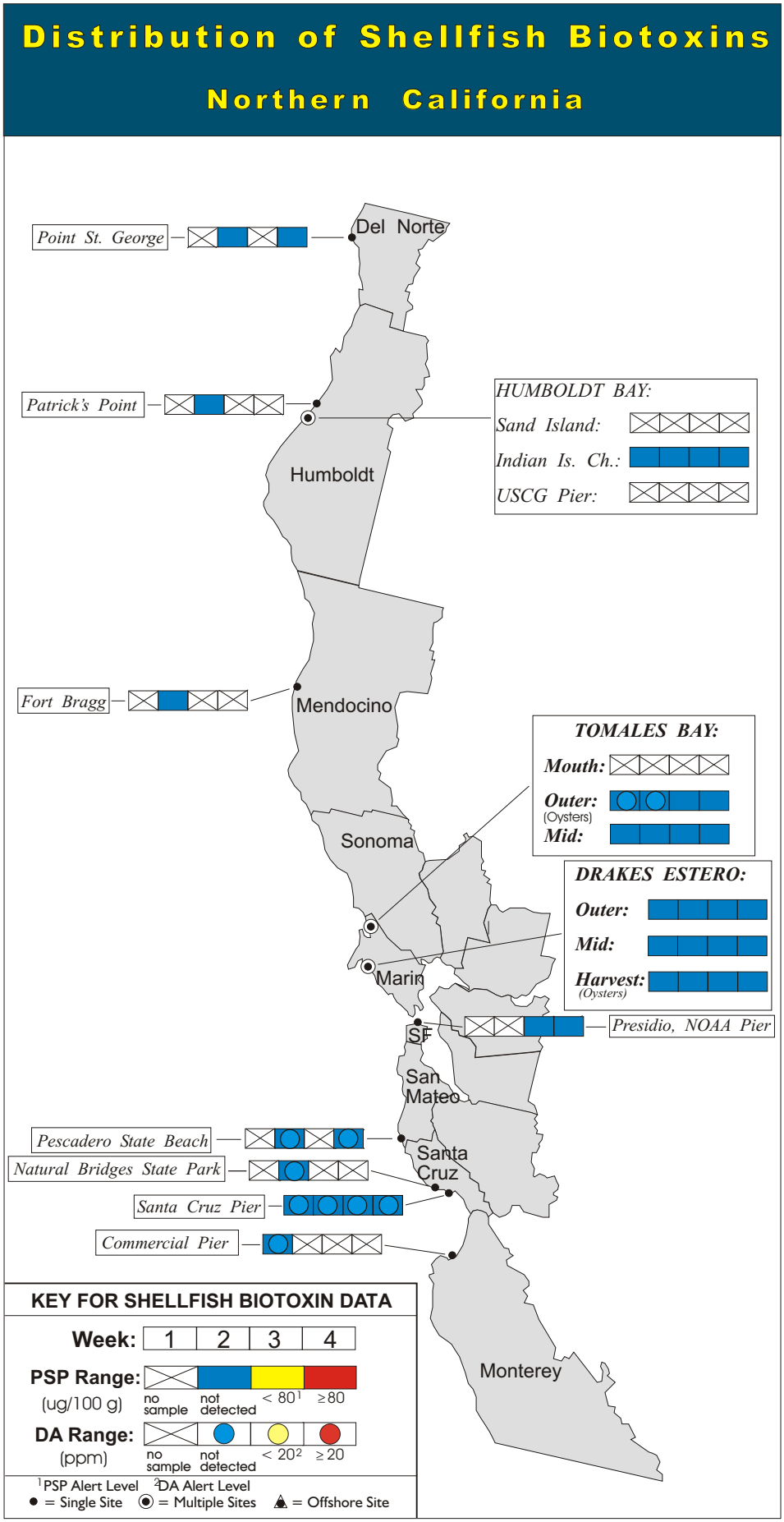
Southern California Summary:

Paralytic Shellfish Poisoning (PSP): PSP toxins were not detected during June.

Domoic Acid (DA):

DA was absent from most mussel samples in June. Only one site, Leo Carillo Beach (Los Angeles County), had a detectable level of DA (2.7 ppm on June3).

In contrast, samples of pelagic red crab from both nearshore and offshore of Los Angeles continued to contain high levels of domoic acid. The highest concentration detected was 240 ppm on June 12 at Cabrillo Beach. A sample of pelagic crabs collected at Royal Palms Beach on June 6 contained 210 ppm of DA. The concentration of DA in pelagic crab from offshore appeared to decrease from May's observations, containing 98 ppm on June 16. A sample of lobster viscera collected from Redondo Beach on June 12 contained 37 ppm of DA. Rock scallops from this same site did not contain DA in either the viscera or adductor muscle.



Northern California Summary:

Paralytic Shellfish Poisoning (PSP):

PSP toxins were not detected in shellfish from northern California sites during June.

Domoic Acid (DA):

DA was not detected in shellfish from northern California sites during June.

The Marine Biotoxin Monitoring and Control Program is a state-wide effort involving a consortium of volunteer participants. The shellfish sampling and analysis element of this program is intended to provide an early warning of shellfish toxicity by routinely assessing coastal resources for the presence of paralytic shellfish poisoning (PSP) toxins.

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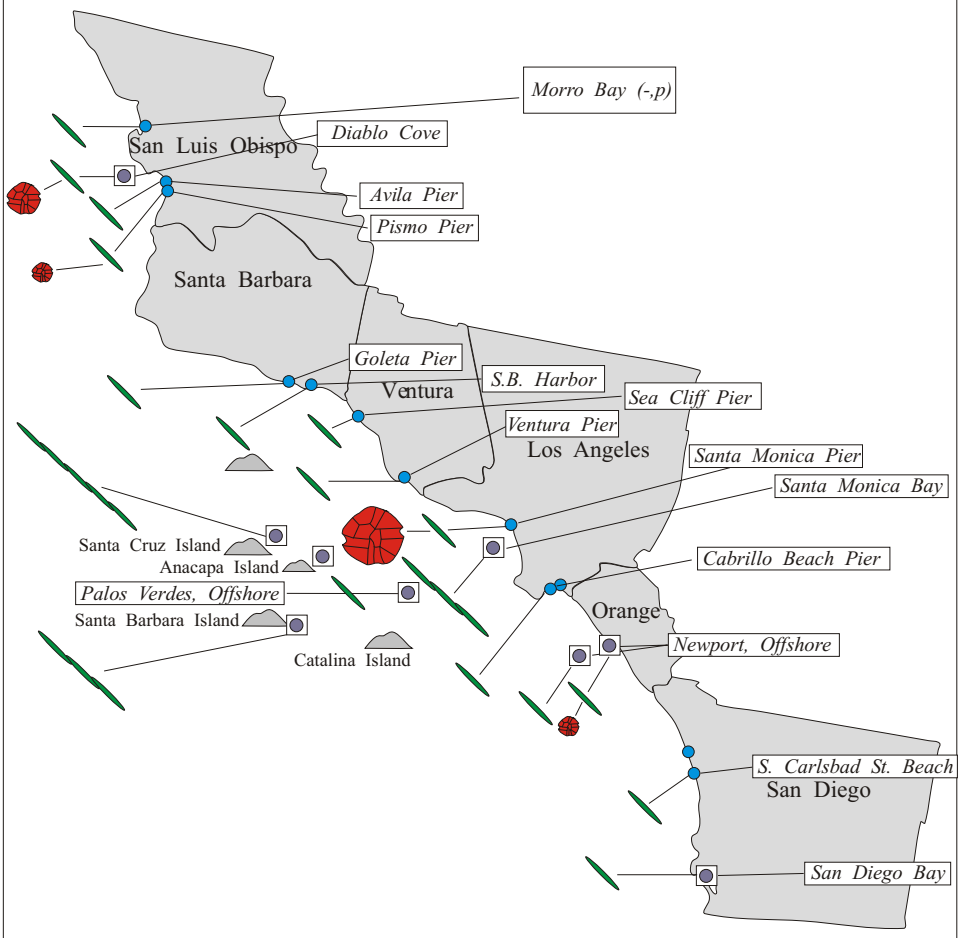
ENVIRONMENTAL MANAGEMENT BRANCH
Phytoplankton Monitoring Program

Phytoplankton Monthly Report

June 2002

Technical Report No. 02-20

Distribution of Toxin-Producing Phytoplankton
Southern California



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Pseudo-nitzschia Species

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For areas with multiple sampling stations, species abundance at each station is represented as follows:
(a,p) = Abundance for Alexandrium and Pseudo-nitzschia.
e.g., (c,p) = common, present; (a,-) = abundant, not observed

Southern California Summary:

Alexandrium catenella (Dinoflagellate that produces paralytic shellfish poisoning (PSP) toxins). The distribution and relative abundance of *Alexandrium* along the southern California coast in June was equivalent to May's observations. One exception was a sample collected on June 13 at Santa Monica Pier (Los Angeles County) that contained significant numbers of *Alexandrium*. PSP toxins were not detected in mussels collected farther upcoast and downcoast from this site.

Pseudo-nitzschia species (includes all known potential domoic acid producing diatoms). The distribution of *Pseudo-nitzschia* along the southern California coast in June was similar to previous observations, however there was a dramatic decrease in relative abundances throughout this region.

The decline in this diatom was mirrored in the shellfish analytical results, which showed that domoic acid was nondetectable at most sites. Interestingly, elevated numbers of *Pseudo-nitzschia* were detected offshore near Santa Cruz Island. Corresponding high domoic acid concentrations continued to be detected in pelagic red crab as reported in technical Report #02-19.

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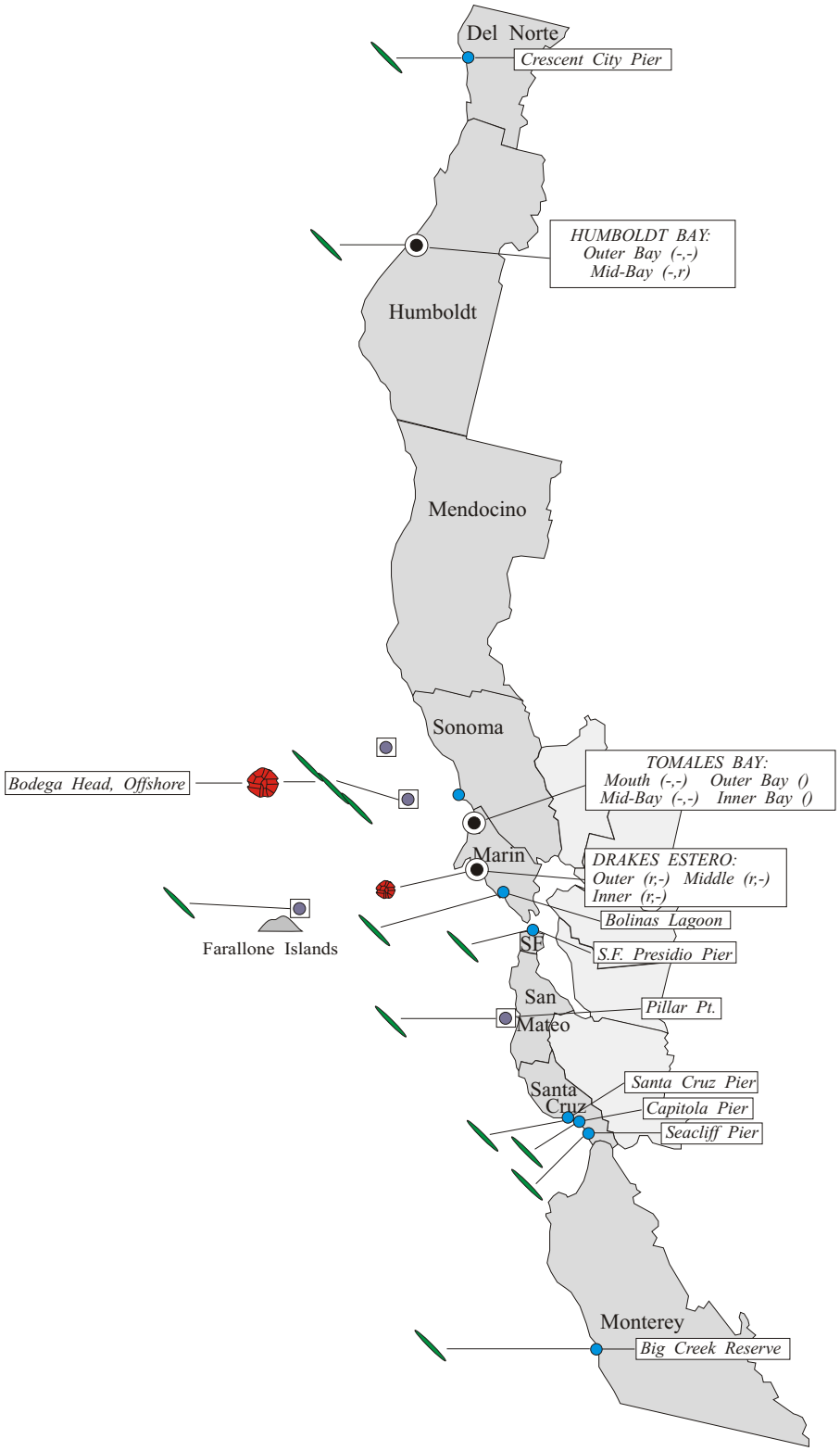
Distribution of Toxin-Producing Phytoplankton Northern California



Northern California Summary:

Alexandrium catenella (Dinoflagellate that produces paralytic shellfish poisoning (PSP) toxins). There was a decrease in the distribution and abundance of *Alexandrium* in June compared to observations in May.

Pseudo-nitzschia species (includes all known potential domoic acid producing diatoms). The distribution of *Pseudo-nitzschia* along the northern California coast in June remained similar to May's observations, although relative abundances decreased somewhat. The elevated relative abundance of *Pseudo-nitzschia* observed just inside Tomales Bay in April and May had disappeared by June. This observation was supported by analytical results of shellfish samples from farther inside the Bay, which no longer contained detectable levels of domoic acid.

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